U. S. La Farge

ENTOMOLOGICAL NEWS

JULY, 1940

Vol. LI No. 7

CONTENTS

Pyle—The Anatomy and Histology of the Digestive System of a supposedly Non-Feeding Adult Moth, Callosamia promethea Dru. (Lepidoptera: Saturniidae) 181

Yellow Fever Service in Brazil 185

Rau—The Life History of the American Cockroach, Periplaneta americana Linn. (Orthop.: Blattidae) 186

Blaisdell—A New Species of Helodes from Marin County, California (Coleoptera: Dascillidae) 190

Belkin—Notes on North American Bostrichidae (Coleoptera) 192

Walker—A New Gomphus from Louisiana (Odonata, Gomphidae) . . 194

Knowlton—A New Geranium Aphid (Homoptera: Aphididae) 196

List—Rocky Mountain Conference of Entomologists 197

Young—Description of a New Water Beetle from Florida (Coleoptera; Dytiscidae) 198

Tenth Meeting of the Biological Photographic Association 200

Current Entomological Literature 201

Review of Harvey's Living Light 208

Obituaries—Dr. Willis Stanley Blatchley and Dr. Ralph Voris. . . . 210

PHILADELPHIA, PA.
THE ACADEMY OF NATURAL SCIENCES,
1900 Race Street

Entered at the Philadelphia, Pa., Post Office as Second Class Matter.
Acceptance for mailing at the special rate of postage prescribed for in Section 1.
Act of October 3, 1917, authorized January 15, 1921.

ENTOMOLOGICAL NEWS

published monthly, excepting August and September, by the American Entomological Society.

Philip P. Calvert, Ph.D., Editor; E. T. Cresson, Jr., R. G. Schmieder, Ph.D., V. S. L. Pate, Associate Editors.

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Subscription price per year of ten (10) numbers: United States, Central and South America $3.00, Canada $3.15, Foreign $3.30.

ADVERTISING RATES: Full width of page. Payments in advance.

One issue, 1 in., $ 1.20, 3 in., $ 3.00, 5 in., $ 5.00, 7 in., $ 7.00
Ten issues, " 8.00, " 25.00, " 45.00, " 60.00

SUBSCRIPTIONS. All remittances and communications regarding subscriptions, non-receipt of the "News" or of reprints, and requests for sample copies, should be addressed to

ENTOMOLOGICAL NEWS, 1900 Race Street, PHILADELPHIA, PA.

MANUSCRIPTS AND ADVERTISEMENTS should be sent to the editor, Dr. P. P. Calvert, P. O. Box 14, Cheyney, Pennsylvania. The receipt of all papers will be acknowledged and, if accepted they will be published as soon as possible. If not accepted, authors will be so advised and postage requested for return of manuscripts. Articles longer than six printed pages will be published in two or more installments, unless the author is willing to pay for the cost of a sufficient number of additional pages in any one issue to enable such an article to appear without division. Proof will be sent to authors.

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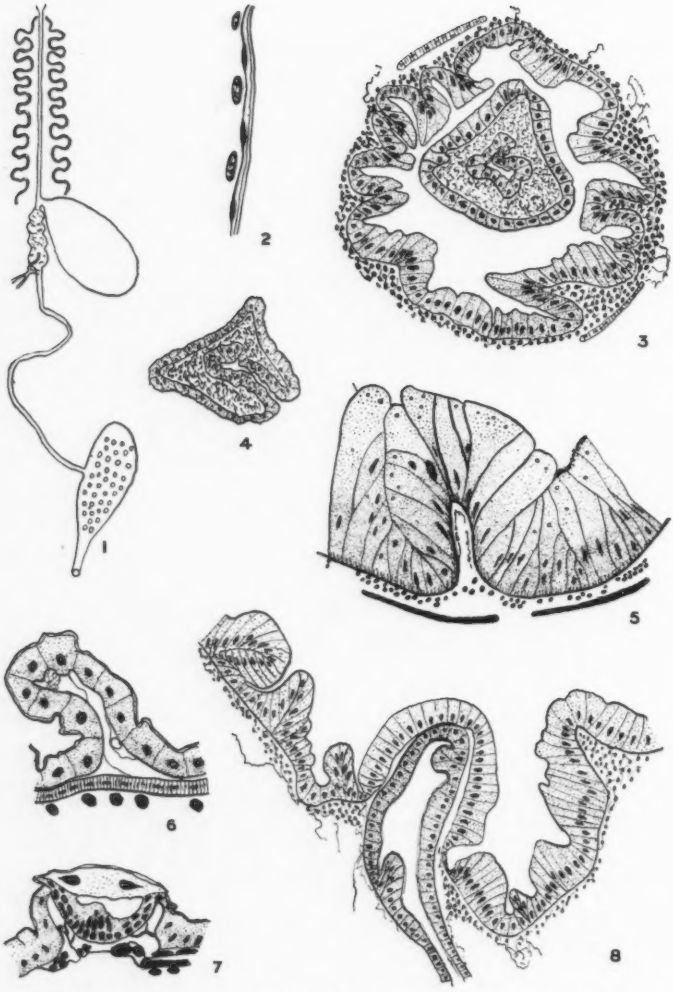


DIGESTIVE SYSTEM OF CALLOSAMIA PROMETHEA DRU., ADULT—PYLE.

ENTOMOLOGICAL NEWS

VOL. LI JULY, 1940 No. 7

The Anatomy and Histology of the Digestive System of a Supposedly Non-Feeding Adult Moth, Callosamia promethea Dru. (Lepidoptera: Saturniidae).[1]

By ROBERT W. PYLE.

(Plate IV).

Callosamia promethea is one of the Saturniid Moths. It is said never to feed in the adult stage. This statement aroused my interest to examine the digestive tract to determine whether or not it is in any way different from the digestive systems of feeding Lepidoptera, and whether any part is atrophied. I wish to thank Dr. P. P. Calvert for his kindly criticisms and for specimens used as collateral material.

METHODS AND MATERIALS

Cocoons of *Callosamia promethea* were collected during the fall of 1938 and were kept indoors in order to force the emergence of the moths. Some were killed as soon as they left the cocoons, while others were permitted to live several days. No attempt was made to feed them at any time.

The specimens were fixed in two ways: (1) B-3 for twenty-four hours and (2) warm water (85 degrees Centigrade) for two or three minutes. The material fixed in warm water was cut open along the abdomen, upon removal from the water, and placed in 50% alcohol for six hours after which it was transferred to 70% alcohol and kept until used for microscopic sections or dissection.

Serial sections were made of a number of specimens. Dioxane dehydration was most satisfactory as dehydration in alcohol and subsequent clearing in oil tended to produce a very great shrinkage and brittleness. The tissues were dehydrated from twenty-four to thirty-six hours in dioxane, and

[1] Presented to the Faculty of the Graduate School of the University of Pennsylvania as a thesis in Zoology in partial fulfillment of the requirements for the degree of Master of Arts, 1939.

infiltrated for six hours in either paraffin or tissuemat. In some cases tissuemat was preferable to paraffin. Sections were cut from ten to twenty micra thick. It was also helpful to soak the paraffin block (after partial cutting) in water for six to eight days in order to soften the chitin thus avoiding tearing the sections in cutting.

Haemalum and equeous eosin were the best stains for sections from material not stained *in toto*. *In toto* staining saves time; alum cochineal and alum carmine were used; these were counterstained with fast green (0.01% solution in 95% alcohol). Other stains used were Delafield's haemotoxylin, alcoholic eosin, alcoholic cochineal, picric acid and picrofuchsin.

Notes on the Literature on the Digestive System of Lepidoptera.

The study of the Lepidopterous digestive system has interested anatomists since the times of Reaumur and Latreille, but there is no need to review the early literature here. Burgess (1880) in his account of *Danais archippus* was the first to give an accurate description of the digestive system. Minot and he (1884) pointed out that the salivary glands of *Aletia xylina* empty into the lower part of the buccal cavity This is not the case in *C. promethea*.[2]

Bordas (1920) has given an account of the digestive systems of species of Papilionidae, Nymphalidae, Satyridae, Notodontidae, Saturnidae, and Noctuidae. He describes the gross anatomy and histology of these pointing out that they possess numerous "rectal glands". He figures many species as possessing cilia on the ends of the mid-gut epithelial cells and the Malpighian tubule cells.

Snodgrass (1930) has suggested that the so-called sucking stomach is inflated with air, in the case of *Malacosoma americana*, to assist in the breaking of the pupal case when the imago is about to emerge. This seems to be the case with *C.*

[2] Ito (1915, 1920a and b, 1921) has described the anatomy and histology of the silk glands, alimentary canal and Malpighian tubes, in connection with the metamorphosis of these organs of the silkworm into those of the non-feeding adult, although without comparisons with other species. We are indebted to Dr. A. Glenn Richards, Jr., for calling our attention to Ito's contributions. P. P. Calvert.]

promethea. Swingle (1931) states that the tissue of the fore and mid-gut of *C. promethea* adult is capable of digesting maltose and fats. Wigglesworth (1932) gives the function of the "rectal glands" as absorptive. He quotes Borri (1925) as having shown that *Bombyx mori* has as many of these "glands" as do the Pieridae. They are very numerous in the case of *C. promethea*. Schmitt (1938), in his account of the feeding mechanism of Lepidoptera, figures (11-B p. 23) *Samia cecropia* as having the salivary ducts emptying into the buccal cavity. This is not the case in *C. promethea*. Generalized accounts of the digestive system of Lepidoptera are contained in the texts by Imms (1933) and Snodgrass (1935).

ANATOMY OF THE SYSTEM. (Plate IV, fig. 1)

Mouth Parts—External. The clypeus covers the anterior portion of the head between the compound eyes. Its lateral boundaries are well marked by sutures. On the ventral margin of the clypeus there is a very small labrum. On either side of the labrum are the rudiments of the mandibles which are immovable and functionless. Behind the mandibles are the maxillae which are so atrophied that only the galeae protrude as two shapeless lobes. The mouth cavity opens just posterior to the labrum and anterior to the galeae. Between the galeae protrude the remnants of the spinneret which forms the external opening of the salivary ducts. The labium is small; the labial palps are short bristled, three-jointed structures.

Buccal Cavity or Sucking Pump. The buccal cavity opens to the exterior at a point just anterior to the galeae of the maxillae. It is a large cavity with respect to the size of the head being in specimens examined about 325 micra wide, 500 micra high (dorso-ventrally) and 630 micra at the widest place antero-posteriorly. It is roughly rectangular in shape, narrowing toward the dorsal area. Structurally it is similar to that of *Samia cecropia* as described by Schmitt (1938).

The Salivary Glands are much folded and extend through the thorax to the abdomen. At the anterior end they empty into narrow ducts which join in a common duct extending to the exterior through the remnants of the larval spinneret. The

ducts from the salivary glands are much thinner than the glands proper. The possible function of the glands may be to secrete a fluid which tends to dissolve the silk strands of the cocoon so that the imago may emerge. This has been suggested by Snodgrass for *Malacosoma americana*. This fluid may also act as a lubricant for the emerging moth.

The Oesophagus is small and very delicate. It follows the dorsal vessel, to which it is attached by a common membrane of connective tissue, posteriorly to the aortic arch. At the aortic arch the oesophagus leaves the dorsal vessel, after both have reached a point that is dorsal to the lowest layer of longitudinal thoracic muscles, and continues posteriorly above these muscles.

The Sucking Stomach occupies the upper portion of the first two and part of the third abdominal segments in the male. In the female it is pressed against the anterior and dorsal walls of the abdominal cavity by the ovaries. It is attached to the posterior portion of the oesophagus just anterior to the mid-gut. It is apparently inflated with air by the insect to facilitate breaking the pupal case as has been suggested by Snodgrass for *Malacosoma americana*. Such a condition is found in the female if she is killed only immediately upon emergence from the cocoon.

Oesophageal Valve. The oseophagus is telescoped into the mid-gut in such a manner as to form a structure called by some the oesophageal valve, or homologue of the proventriculus. The oesophagus is not directly continued into the anterior portion of the mid-gut, but rather extends obliquely into the dorsal surface of the latter. This forms a double layer of cells that is common in other insects. At first the oesophagus causes an invagination in the anterior dorsal wall of the mid-gut, passing somewhat ventrally as well as posteriorly. Soon the dorsal wall of the mid-gut covers the oesophagus so that the latter is enclosed within a layer of mid-gut epithelium and loose connective tissue in the mid-gut (fig. 3). The oesophagus terminates in a ventral position and has but a small posterior opening (fig. 4).

Mid-gut. The mid-gut is a much wrinkled structure which is two to four times as long as wide. This varies with the individual and is proportionally longer in the female on account of the pressure of the ovaries. It extends from the posterior half of the first segment to the hind end of the second abdominal segment. It is much wider than either the oesophagus or the intestine. In the male it is supported by loose connective tissue and fat, but in the female it is much compressed by the pressure of the ovaries. It is filled with a brown fluid which is probably waste material left from the pupal stage. There are no gastric caeca.

Malpighian Tubules. There are six Malpighian tubules present. They are much folded upon themselves and when extended are longer than the abdominal cavity. They are divided into two groups, each consisting of three on each side, which are united in a common duct which joins the alimentary tract at the junction of the mid-gut and intestine. They also have more or less of the brown waste material within them.

The *Intestine* is nearly as long as the abdominal cavity, and lies folded upon itself in the ventral part of that cavity except where it extends dorsad to join the rectrum. In the female it is much compressed by the ovaries, but in the male it is supported by loose connective tissue and fat. It also contains the brown material found in the mid-gut.

The *Rectum* is pear-shaped, the anterior end being the broader. The intestine enters it on the ventral surface near its middle and extends into it for some distance. There are many round gland-like structures in its walls.

(To be continued.)

Yellow Fever Service in Brazil.

The Rockefeller Foundation has been in charge of the administration of the government Yellow Fever Service in Brazil for 16 years. Arrangements were made to surrender this responsibility at the end of 1939. Those sections devoted to the control of aegypti breeding, viscerotomy and vaccination have been incorporated by presidential decree in a special National Yellow Fever Service, subordinated directly to the Ministry of Education and Health.—*Rockefeller Foundation, President's Review for 1939.*

The Life History of the American Cockroach, Periplaneta americana Linn. (Orthop.: Blattidae).

By PHIL RAU, Kirkwood, Missouri.

(Continued from page 155.)

THE EGG-CASE.

The egg-case is constructed within the walls of the female reproductive tract where it is slowly pushed out into the open air and requires about 24 hours for completion. It may be removed with the forceps at any stage of its development, a complete egg-capsule containing eggs with, strangely enough, both ends closed. It is not dropped as soon as completed, but protrudes from the body for, from several hours to a day or two, and sometimes for even three days, but rarely four days. Here is an example of what happened in one case and shows how slow the process may be: April 19, 10 P. M., egg-case is just beginning to protrude from the ovipositor; 36 hours later it is three-fourths complete and after another 36 hours it protrudes about seven-eighths of its length, and finally after another half day it is dropped as a completed egg-case—the whole process consuming about three and one-half days. We do not know just what causes the mother to retain the egg-case in this way for so long a time, or why she retains it at all. It was thought at one time that conditions of moisture or temperature were factors that influenced the retention of the egg-case, but many observations made by me on cockroaches in confinement, show decidedly that these are not the factors involved. The American cockroaches are very particular about concealing the egg-cases and it seems more likely that they carry them about until they find the proper hiding places.

There is a very important reason why the mother wishes to conceal her egg-case, for those that are not concealed would soon become food for other roaches in the cage. So serious is the habit, that if I did not provide debris and crevices for their concealment I would get no egg-cases for study. The hiding places in the cages were crumpled bits of paper, pieces of corrugated cardboard, portions of rotten wood, pyramids built up of sticks and hollow thread-spools. However, the

cockroaches are not satisfied with merely hiding them, but would always cover them with the surrounding material. If they dropped the oötheca in a piece of crumpled paper, they always chewed out bits of the same paper, masticated it into pulp and glued it bit by bit all over the egg-case, thereby completely hiding it. I have several egg-cases that look very pretty, completely covered with rough bits of yellow, or blue or white paper-pulp which was gotten from the surrounding medium. I obtained cockroach egg-cases deposited on pieces of rotten wood that were completely covered by chewed-up bits of the same wood. When the soft or rotten wood is used, I find that the egg-cases are not merely placed on it but are actually buried in it; a groove having first been chewed out. The egg-case is then dropped in it and later completely covered with masticated bits of the same material, solidly glued, mouthful by mouthful, in place. The force of habit in covering the egg-case is so great that when no crevices or debris are at hand, the mothers place the egg-cases on the floor in the angle of the wall, and then cover them with the only material available—the fine dust on the floor, mixed with their own saliva. The dust they evidently brush together with much labor. In a rusted tin lid, in one cage I found a row of egg-cases glued against its inside edge, and every one of them so covered with red rust that they had completely escaped my notice and I filled the lid with water several times before I discovered them. In another tin lid which I had filled with white sand, I found more than a dozen egg-cases so completely covered with white sand (not loosely covered with it, but the grains of sand actually glued on them) that I surely would have been deceived had I not known what to expect. That the cockroaches often carry this covering material for some distance was seen in several egg-cases that were covered with rotten wood. The only source of this material in that cage was a piece of rotten wood at least four inches away from the egg-cases. Another observation was on three egg-cases covered with fine black dust in the top of a clean hollow hardwood spool. The dust could only have been gathered

from the floor, which meant transporting it to the top of the spool for a distance of at least five or six inches. The hardwood of the spool was evidently too much for their jaws to dismember so they went to a distant point and obtained dust.

The concern shown for the egg-cases by the mothers, and the extreme effort which they expend to make them protectively colored indicates that this behavior is more intelligent than instinctive. One needs only to read the account by Haber* who spent most of one night watching a female trying to hide her egg-case, to feel that if any insect behavior at all may be called intelligent, this is an example. He tells us that at 2:50 A. M., a female *P. americana* began to scar and roughen with her mandibles the surface of a pasteboard slab, which was placed in the cage to serve as material upon which to oviposit. "She chewed and munched at the upper surface of the pasteboard until she made quite an appreciable groove there, not dropping the bits of pasteboard upon the bottom of the cage, but mixing them by means of the mouth parts with a secretion from the mouth until they became a damp mass. This mass of finely chewed pasteboard stuck to the surface of the board from which it was chewed. At about 3.20 A. M., she crawled forward over the scar and with her abdomen bent anteriorly and ventralward, probing about with the protruding ootheca until she located the scar which she had made. Then she dragged the ootheca into it, but the scar being too shallow the ootheca rolled out and fell to the floor of the cage. The female turned about and with her palpi sought for the ootheca. Finding it missing, immediately she ran down the paste-board, seized the ootheca by its flanged edge with her mandibles, straddled it with her front legs and thus carrying it, returned to the scar. "Again she was unsuccesful in keeping it there and for a second time, she ran down, seized it as she previously had done and set out to locate the scar. She ran almost up to it, then becoming confused ran around to the opposite side of the pasteboard, stopping at intervals and holding the ootheca clasped between the femur and tibia of one

* Ent. News 31: 190-193, 1920.

front leg. Again it slipped from her grasp and bounced to the far end of the cage. She promptly located it, but "seemed to have decided that it was futile to attempt to place it in the originally selected location." She coated the exposed side and ends with a secretion from her mouth and from the bottom of the cage picked up loose bits of trash, attempting to conceal the ootheca by covering it over with them. "Next she attempted to cover the ootheca with a piece of paper. It did not suit her so she discarded it."

Covering these egg-cases certainly saves them from the onslaughts of the voracious adults as I know from my own observations, but it seems to me that hungry cockroaches should find them in spite of their protective coloration, and they should do so by the sense of smell rather than that of sight. The sense of smell is supposedly highly developed in these insects but, after all, how do we know but that the egg-cases may be odorless?

The senses of smell and sight need to be worked out more fully in an experimental way than it has so far been done. It seems to me that the sense of sight is a great factor in the lives of the roaches, but only at night. During day-light hours, and at night with artificial light, one may bring a glass rod to a point a few millimeters from their eyes without startling them; one may also with a tooth-pick place a drop of paint upon their bodies without arousing them; one may even approach a cockroach with a scissors and remove the antennae, and get no reaction until the blades come together. The sense of sight, however, must be an important factor in their lives at night or how could they, in the dark, procure bits of debris, carry it to and locate a distant egg-case, or how could they locate an egg-case that bounces to the far side of the cage, or how, again, could they find decayed wood at a distant point and make repeated trips to it for the bits of wood they need to cover an egg-case?

(To be continued.)

A New Species of Helodes from Marin County, California (Coleoptera: Dascillidae).

By Frank E. Blaisdell, Sr., Stanford Medical School and Associate in Research, California Academy of Sciences, San Francisco, California.

The species described below was collected under conditions which revealed some very unusual and interesting habits. A colony was discovered on the under surface of a rather large flat rock, that projected out of and over the surface of the water, at an angle of few degrees, in a rather swiftly flowing stream. When the rock was lifted up the beetles were disturbed, most of them falling upon the water. As soon as they struck the water, they began to swim briskly and to gyrate as do the Gyrinids; they dove beneath the surface and swam rapidly under the surface, all endeavoring to return to the rock.

Helodes aquatica new species.

Form oblong-oval, about two and one-half times as long as wide, pronotum and head narrowing moderately anteriorly. Color black to more or less piceous; pronotum testaceous and often tinged with rufous and with a varying black area at center; two basal segments of antennae, meta-trochanters, procoxae more or less pale. Luster somewhat shining. Pubescence short, dense, recumbent and not wholly obscuring the surface, dull cinereous, with a tinge of fuscous, depending on the angle of view and illumination; that of the pale areas yellowish, that of the body beneath shorter, finer, less abundant and appressed. Hairs of the antennae ashy, short and erect especially in the male.

Head relatively small, front evenly and rather moderately convex, shining, densely punctate, punctures small and finely asperate; epistoma transversely arcuate and prominent, apex truncate in moderate circular arc. Labrum transverse, strongly deflexed beneath the epistomal apex. Eyes large, round, strongly convex, facets small and numerous. Antennæ long and slender, segments elongate; second segment very small, short, about as long as wide; remaining segments elongate, third obconical and longest, five times as long as the second and one-fifth of its length longer than the fourth; other segments subequal in length; fifth to eighth inclusive somewhat compressed, more prominent anteriorly than posteriorly, nine to ten more cylindrical, the latter slightly shorter.

Pronotum transverse, about two-thirds wider than long, sides strongly and broadly arcuate, converging and continuous with the slightly arcuate apex; base moderately and arcuately lobed in middle two-fourths, thence broadly sinuate and transverse to the rounded basal angles. Disk rather evenly and more strongly convex in the central area than laterally; lateral margins thin and narrowly explanate, subdiaphanous and feebly reflexed; apical margin scarcely or very slightly reflexed, bead very fine, that of the base distinct; rather densely punctate, punctures small, slightly asperate, separated by a distance equal to one or two times their diameter.

Elytra oblong, moderately and evenly convex; sides parallel and slightly arcuate, rather broadly rounded apically; humeri well rounded and not in the least tumid or prominent; surface rather densely punctate, punctures small, slightly asperate, with a tendency to arrangement in transverse rows, separated by a distance equal to two or three times their diameter, Scutellum triangular.

Under surface of body densely punctate, punctures small. Legs somewhat elongate and slender; fifth tarsal segments and claws small. Outer surfaces of the tibiae invested with slender spinules.

♂.—Usually smaller and narrower. Anterior tibiae moderately constricted in basal third and there more cylindrical. Fifth ventral abdominal segment with a small triangulo-oval emargination at middle, the medial margins of the apical lobes moderately arcuate.

♀.—Broader and stouter. Anterior tibiae not constricted. Abdomen very finely punctate; fifth ventral arcuate at apex.

Measurements.—(Types) Length 4.5 to 5 mm.; width 2 to 2.4 mm.

Holotype.—Male, No. 4965, and *allotype*, female, No. 4966; in the author's collection, Museum of the California Academy of Sciences; collected June 4, 1911, at Lagunitas, Marin County, CALIFORNIA (*vide supra*).

Paratypes.—17. Distributed as follows: Author's collection, Mus. Calif. Acad. Sci., 6; Colln. Amer. Ent. Soc. of Phila., 4; Colln. of Edwin C. Van Dyke, Mus. Calif. Acad. Sci., 7, with same data.

Notes on North American Bostrichidae (Coleoptera).

By JOHN N. BELKIN, Cornell University, Ithaca, New York.

The following changes appear to be necessary in the nomenclature of North American Bostrichidae.

Sinoxylon floridanum Horn has been considered a distinct species and has been placed in *Xylobiops*. I have examined Horn's type at the Academy of Natural Sciences of Philadelphia and find that it is a female of *Xylomeira torquata* (Fab.). I have seen other specimens of the same species from Florida. *Xylomeira torquata* (Fab.) is of general distribution in the West Indies.

Lichenophanes mutchleri new name.

Bostrichus angustus Casey (Jour. N. Y. Ent. Soc., 1898, 6: 72) is preoccupied by *Bostrychus angustus* Steinheil (Atti Soc. Ital. Sc. Nat., 1872 [1873], 15: 574). Casey's species is a *Lichenophanes*, as was pointed out by Lesne (Coleopt. Cat., Pars 161., 1938, p. 33). Therefore I propose the above name for *Bostrichus angustus* Casey *nec* Steinheil.

CORRECTIONS TO THE LENG CATALOGUE.

A number of other changes have been made in past years by Pierre Lesne. Those that have not been incorporated in the Leng Catalogue I take the opportunity of listing here, together with corrections in bibliographical citations.

Tetrapriocera longicornis (Oliv.). This name should remain, as Lesne (Bull. Soc. Ent. Fr., 1937, p. 239) has found that *Apate tridens* Fab. is not this species but probably a male *Xylomeira torquata* (Fab.), although the condition of the type does not permit final identification. The reference for *? Apate tridens* Fab. as a possible synomyn of *Xylomeira torquata* (Fab.) should read 92-362.[1]

Xylobiops basilaris (Say), *X. texanus* (Horn), *X. sextuberculatus* (Lec.), and *X. parilis* Lesne are the correct spellings for these names.

Dendrobiella aspera (Lec.) is a distinct species. *D. pubescens* Casey is a synonym of *D. sericans* (Lec.).

[1] This method of reference to year and page of the author quoted is that used in the Leng Catalogue of Coleoptera.

Amphicerus cornutus (Pallas). The reference should be 72-8. *Amphicerus bicaudatus* (Say), *A. aspericollis* (Germ.), and *Bostrichus serricollis* (Germ.), are synonyms of *Amphicerus hamatus* (Fab.). The reference to *A. aspericollis* (Germ.) should read 24-465, and to *A. hamatus* (Fab.), 87-33.

Lichenophanes lucanus (Web.). I have not been able to locate a description of this species nor any other reference to it. It appears, therefore, to be a *nomen nudum*. The reference to *Lichenophanus californicus* (Horn) should read 78-546.

Bostrichus bicornis (Web.) is a *Lichenophanes*. *Apate bicornis*, described by Thomas Say in Jour. Acad. Nat. Sci. Phila., 1823, 3: 319-320, is a synonym of *Lichenophanes bicornis* (Web.). *Bostrichus capucinus* (L.) is the only species of the genus *Bostrichus*. The reference to it should read 58-355.

Dinoderus brevis (Horn) is an Indo-Malaysian species and distinct from *D. minutus* (Fab.).

Exops Curtis (Trans. Linn. Soc. London, 1839, 2: 204) should be added as a synonym under *Polycaon* Castelnau, together with *Allaeocnemis* Lec. but not *Exopioides* Guér. nor *Heterarthron* Guér. (see below). Lesne regards *Polycaon punctatus* Lec. as a distinct species with *P. pubescens* Lec. as the female form. I have not seen enough material to form an opinion whether or not this is correct.

Heterarthron Guér. is believed to be a valid genus by Lesne with *Exopioides* Guér. a synonym. *Heterarthron femorale* (Fab.), *H. gonagrum* (Fab.), and *H. exesum* (Lec.) are all distinct species. *H. exesum* (Lec.) occurs in Lower California and Central America in general. *H. femorale* (Fab.) and *H. gonagrum* (Fab.) are both reported from the West Indies and probably are not to be found in North America. The Texas record in the Leng Catalogue is probably based on a misdetermination.

Psoa sexguttata Lesne (Ann. Soc. Ent. Fr., 1906, 75: 393) is an aberration of *P. quadrisignata* (Horn). *Psoa cleroides* Lesne (Bull. Mus. Hist. Nat. Paris, 1913, p. 273) should be added as a distinct species.

A New Gomphus from Louisiana (Odonata, Gomphidae).

By E. M. WALKER, University of Toronto, Canada.

(Plate V).

Among some dragonflies from the southern United States, sent to the writer for identification by Mr. John Standish of the University of Oklahoma, were seven males of an apparently new species of *Gomphus* from Hammond, Louisiana, taken by Mr. Standish on March 26, 1938.

Drawings of the appendages and genitalia were sent to Dr. Septima Smith and Mrs. H. K. Gloyd but neither was able to place the species. It is very close to *G. exilis*, but differs somewhat in the form of the anal appendages and in coloration. It is certainly not closely related to any other species in Needham's Handbook of North American Dragonflies and, in fact, appears to be new.

Gomphus flavocaudatus n. sp.

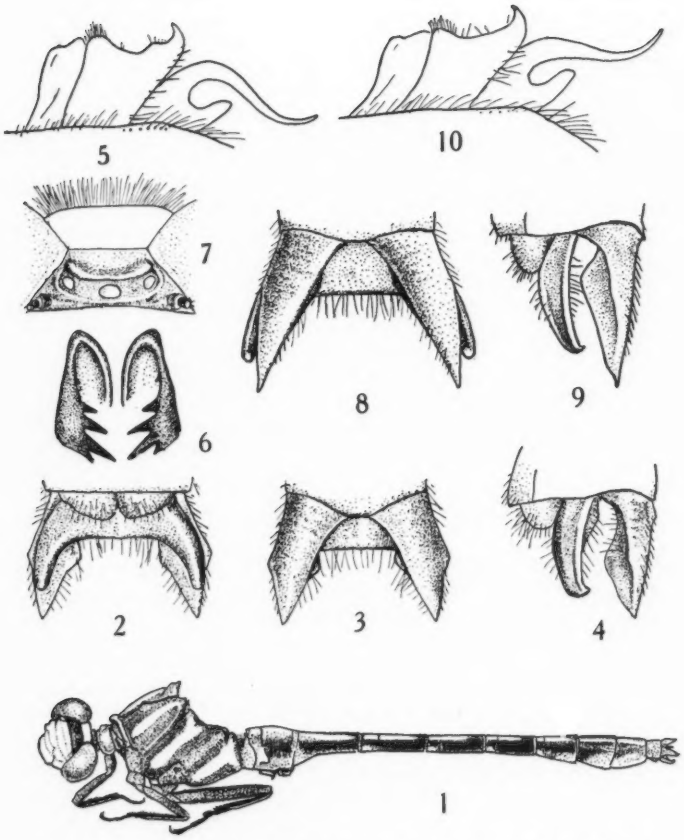
♂ (♀ unkown). Occiput and entire face, including labrum and mandibles, greenish yellow; labium and venter of head pale yellowish drab; vertex black; rear of head dark brown above, grading into ochraceous below.

Prothorax pale dull brownish, front lobe, sides and median tubercles of middle lobe, and most of hind lobe pale yellow. Synthorax reddish brown, the paler markings yellowish green, viz., the antehumeral bands, which extend from the ante-alar sinus to the anterior transverse carina, diverging somewhat cephalad, the intervening space at base nearly twice as wide as one of the bands; a narrow humeral line, not always distinguishable; the lateral thoracic bands, which are straight, the first (mesepimeral) about 1 mm. broad, nearly equal but widening slightly towards the upper ends; and the metepimeral bands which are more expanded above. Interalar area green.

Femora dark brown; tibiae nearly black with the extensor surfaces pale yellowish; tarsi black, the first two segments of the metatarsi sometimes with a dorsal yellowish streak.

Wings with costal veins yellowish, the venation otherwise blackish, pterostigmata reddish brown.

Abdomen dark brown with the following parts yellow: a mid-dorsal longitudinal stripe, extending the entire length but more or less interrupted posteriorly on each segment and intersegmentally, sometimes becoming less distinct on segments



GOMPHUS FLAVOCAUDATUS N. SP., 1-7; G. EXILIS 8-10.—WALKER.

7 and 8 and then widening on 9 to include the whole dorsum or most of it, the yellow of the dorsum merging more or less with that of the sides, narrowing again on 10; also the auricles, anterolateral spots on segments 3-7 and large lateral areas on 7-9, which are especially large and conspicuous on the expanded parts of 8 and 9, where the yellow appears to be of a deeper and brighter shade than elsewhere on the abdomen.

Hind margin of occiput slightly convex, or nearly straight in the middle, straight as viewed edgewise. Hind femora more than three fourths as long as the synthorax, hind tibiae a third shorter. Abdomen about one fourth longer than the wings, three and one-half times as long as synthorax, slender, segments 7-9 moderately expanded, 7 slightly shorter than 6 but about one-half deeper, 8 and 9 successively a little shorter, their lateral margins slightly flaring and their posterior angles a little produced; segment 8 broadest and deepest of the distal segments, its hind margin slightly oblique, slightly longer on the dorsal than the ventral side. Viewed from above the abdomen is widest at the distal end of 8, being here nearly twice as broad as the narrowest part, narrowing again rapidly on 9. Auricles subangulate with sides and apex well rounded.

Accessory genitalia on segment 2 very similar to those of *G. exilis*, the anterior hamuli parallel-sided, the apices with the concavity directed meso-caudad; the inner margin bearing 4 or 5 sharp, black teeth of various sizes (fig. 6), which are longer than those of *G. exilis;* posterior hamuli similar to those of *exilis* but with a slight prominence at the base of the terminal hook (fig. 5).

Venation as in *G. exilis*. Antenodals: fore wings 10-13, usually 12, the first and fifth (rarely fourth) thickened; hind wings 8-9, the first and fifth (rarely fourth) thickened. Postnodals: fore wings 7-11, usually 9 or 10; hind wings 7-10, most frequently 9.

Measurements: total length (mm.) 45-47; abd. excl. apps. 32-34; hind wing 25, 26; hind femur 7; pterostigma 2.75-3.

Holotype ♂, Hammond, Louisiana, March 26, 1938, to be deposited in the U. S. National Museum. *Paratypes* in Royal Ontario Museum of Zoology, Toronto, Ontario, and the Academy of Natural Sciences of Philadelphia.

EXPLANATION OF PLATE V.

Figs. 1-7 *Gomphus flavocaudatus* n. sp. ♂. 1. Dorsolateral view, showing colour pattern; 2, anal appendages ventral view; 3, same, dorsal view; 4, same, profile; 5, accessory

genitalia, left profile; 6, apices of anterior hamuli; 7, occiput and vertex.

Figs. 8-10, *Gomphus exilis* Selys. 8, Anal appendages, dorsal view; 9, same, profile; 10, accessory genitalia, left profile.

A New Geranium Aphid (Homoptera: Aphididae).[1]

By GEORGE F. KNOWLTON.[2]

The following report deals with aphids known to attack *Geranium* sp. in Utah or nearby. One species is described as new and the previously undescribed alate vivipara of *Macrosiphum aetheocornum* S.-K. is briefly described and figured.

Key to Intermountain Geranium Aphids.

1. Cornicles swollen .....*Amphorophora geranii* (G.-P.)
   Cornicles cylindrical 2
2. Head without prominent antennal tubercles, *Aphis rumicis* L
   Head with prominent antennal tubercles.....3
3. Hairs on vertex conspicuously capitate .....
   Capitophorus cefsmithi n. sp.
   Hairs on vertex not conspicuously capitate.....4
4. Hairs absent from cornicles
   Macrosiphum solanifolii (Ashm.)
   Hairs present on cornicles 5
5. Cornicles reticulated....*Macrosiphum aetheocornum* S.-K.
   Cornicles without reticulations
   Macrosiphum crenicornum S.-K.

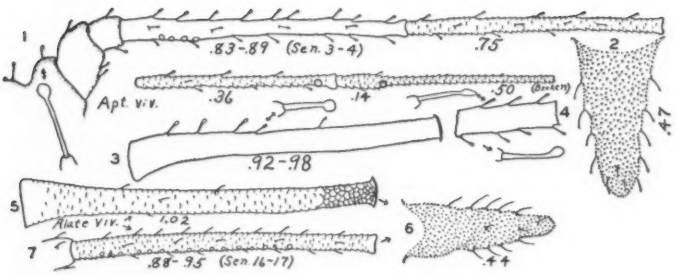
Capitophorus cefsmithi n. sp.[3] Figs. 1-4.

Apterous vivipara: Size 3.2 mm. long, 1.9 cross the abdomen and 0.63 mm. width of head through eyes; antennal III, 0.83 to 0.89 mm. with 3 to 4 sensoria; IV, 0.75 mm.; V, 0.36; base of VI, 0.14 mm., unguis 0.5 plus (broken); rostrum reaching third coxae, rostral IV plus V, 0.19 mm., slenderly obtuse; legs rather stout, hind tibiae 2.6; hind tarsi 0.14; cornicles pale, 0.92 to 0.98, and armed with several capitate hairs; cauda pale, 0.44 mm.; cuticula of body rather rugulose, especially on sides of thorax.

[1] Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

[2] Research associate professor.

[3] The writer is indebted to Dr. C. F. Smith for his opinion concerning this species and for making the drawings.



Capitophorus cefsmithi n. sp. Aptera, 1-4. *Macrosiphum aetheocornum* S.-K. Alate, 5-7.

Collection: On wild *Geranium* in Cowley Canyon of Logan Canyon, Utah, May 31, 1934 (T. O. Thatcher).

Type: In the collection of the writer.

Taxonomy: This species resembles *Macrosiphum crenicornum* S.-K. (which also occurs on wild *Geranium* in Utah) but differs in having conspicuously capitate hairs on head and cornicles.

MACROSIPHUM AETHEOCORNUM S.-K. Figs. 5-7.

Alate vivipara: Body 2.65 mm. long antennae dusky beyond base of III; antennal III, 0.88 to 0.95 with 16 to 17 sensoria; V, 0.84; rostral IV plus V, 0.176 mm. long, slenderly obtuse; cornicles 0.96 to 1.02, distal 0.16 reticulated; cauda 0.44 mm. long, pale.

One alate female of this species was present among material collected upon wild *Geranium* at Tony Grove Ranger Station in Logan Canyon, Utah, July 18, 1939 (Knowlton). This species may be separated from *Macrosiphum solanifolii* (with which it often occurs) by the presence of hairs on the cornicles.

Rocky Mountain Conference of Entomologists

The sixteenth Rocky Mountain Conference of Entomologists will be held at the Cameron Pass Camp, a rebuilt CCC camp about 75 miles west of Fort Collins, Colorado, August 18 to 23, 1940.

This meeting will again be informal in nature, with arrangements such that the entire family can enjoy a mountain outing

during the period. The accommodations will be comfortable with the meals being furnished at actual cost.

The principle symposium topic will be "Insect taxonomy, its fundamental principles, methods, and relations to other branches of biological science." This, however, will not exclude the many other subjects that come up for discussion. Ample time will be given for collecting, which is especially good for high altitude forms in this immediate area.

The camp is located at an altitude of 9500 feet and is readily accessible on a through mountain highway.

Additional information can be secured by writing the chairman, Dr. R. H. Painter, Manhattan, Kansas, or the secretary, Dr. Geo. M. List, Colorado State College, Fort Collins, Colorado.

GEORGE M. LIST, Secretary, Rocky Mountain Conference of Entomologists.

Description of a New Water Beetle from Florida (Coleoptera; Dytiscidae).[1]

By FRANK N. YOUNG.

On April twelfth, 1934, the late Mr. H. T. Townsend collected a series of six hydroporid beetles in the debris along the shore of Kingsley Lake, Clay County, Florida. The series represents a new species for which I suggest the name **Hydroporus floridanus** sp. nov.

Diagnosis: An aberrant species which keys in H. C. Fall's revision[2] of the genus to his "*pulcher-undulatus*" Group, but does not show close affinities to any of the other members of the group known to me. The thinnish elytra and elongate form suggest some species of the genus *Coelambus,* and in some other respects the species resembles some of the *Deronectes* subgenus, of *Hydroporus.* The closely punctate, rugulose upper surface and the peculiar pubescence along with the acuminate elytra and abdomen should separate this species from all others in the genus.

[1] Contribution from the Department of Biology, University of Florida, Gainesville.

[2] Fall, H. C., A Revision of the North American Species of *Hydroporus* and *Agaporus,* John D. Sherman, Mt. Vernon, N. Y., 1923, pp. 1-129.

Holotype, Male: Elongate, 3.8 mm. long by 1.8 mm. wide, rather acuminate behind. Markedly convex beneath but with the upper surface slightly flattened. *Pronotum* narrowly margined with the margins anteriorly broader; sides subparallel; much broader than long and not greatly narrowed anteriorly; widest about the base; median area with a broad, but rather vague impression; densely and rather finely punctate throughout. *Elytra* thin and acuminate behind, the tips angularly truncate; broadest near the base; densely, rather finely punctate and in part rugulose. *Head* above, finely, densely and irregularly punctate. *Legs*: Anterior and middle tarsi dilated; the anterior claw of each fore and middle tarsus more slender and more strongly hooked than the posterior one; posterior coxal plates irregularly undulate and with a more or less pronounced ridge traversing the distal third. *Abdomen* rather abruptly tapering to the acute last segment and appearing much like a lopsided cone; second abdominal sternite longer than the next three combined; epipleurae of elytra not making contact with the abdomen. *Upper surface* of elytra and pronotum covered with a dense coat of rather coarse, short, prostrate whitish hairs which give the whole upper surface a silvery gray appearance. *Venter* strongly convex; prosternal protuberance well developed; hind coxal processes conjointly produced with a slight emargination at the tip.

Color: Head light fuscous; clypeus light testaceous; pronotum uniformly light fuscous except that the anterior marginal angles are lighter; elytra (beneath the pubescence) almost uniformly light fuscous, except for four lighter spots on the bases, one pair at the margins and the other on either side of the suture; undersurface, legs, antennae, mouthparts, and epipleurae almost uniformly light testaceous.

Allotype Female: Very similar to the male except in the unmodified anterior claw of the fore and middle tarsi, and in the narrower fore and middle tarsi.

Variation: There appears to be little variation in the series before me, except in the secondary sexual characters mentioned above. The thinnish elytra have a tendency to warp when dried after having been in alcohol.

The *holotype* and one *paratype* will be deposited in the United States National Museum, the *allotype* and two *paratypes* will remain in my collection, and one *paratype* is in the collection of the late Dr. H. C. Fall, which is now in the Museum of Comparative Zoology at Harvard College, Cambridge, Massachusetts.

Tenth Meeting of the Biological Photographic Association.

The tenth annual convention of the Biological Photographic Association will be held at the Hotel Schroeder, Milwaukee, Wisconsin, September 12, 13 and 14, 1940. This society is interested in the further study of photography as applied to the biologic sciences, and the improvement of its technic. Scientific photographers from all parts of the country will meet to exchange ideas and information on still and motion picture photography as well as the latest developments in color work. Formal papers will be presented outlining new methods of technic, and there will be informal round-table discussions which will be especially instructive. Commercial firms specializing in the manufacture of scientific photographic apparatus and materials will exhibit and explain the use of their products. A salon consisting of natural color and monochrome prints of biologic and clinical subjects will illustrate a very fine degree of perfection in biologic photography.

During the past year the B.P.A. has offered its cooperation to the United States War Department in connection with a plan to organize clinical illustration units in the medical division in time of war. A questionnaire formulated by the War Department has already been distributed and a complete discussion will be in order at the September meeting.

The membership of the Biological Photographic Association is composed of professional clinical and biologic photographers as well as physicians, dentists and scientists who are interested in this specialized branch of photography. A quarterly journal is published containing articles of vital interest to the biologic photographer. The society also circulates albums dealing with specialized photographic technics and travelling salons for exhibition purposes. These travelling salons are made up of selected prints from the annual meetings and make excellent exhibit material for various scientific conventions. At the end of a year the prints are returned on request to exhibitors.

In view of the growing interest in medical and biologic photography the next annual meeting promises to be especially stimulating and successful. Anyone interested in this subject is welcome to attend the meetings and to submit prints for the salon.

Further information concerning the convention program, salon specifications and membership in the society may be had by writing to the Secretary of the Biological Photographic Association, University Office, Magee Hospital, Pittsburgh, Pa.

Current Entomological Literature

COMPILED BY V. S. L. PATE, L. S. MACKEY and E. G. FISHER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the current or preceding year unless otherwise noted. All continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of Entomological News for 10c. The number of, or annual volume, and in some cases the part, heft, &c., the latter within ( )follows; then the pagination follows the colon :

Papers published in the Entomological News are not listed.

GENERAL.—Anon.—The Charles Robertson Collection to be at Urbana. [12] 33: 423. E. Graywood Smyth establishes laboratory in California. [12] 33: 423. **Barnes, H. F.**—Fluctuations in insect numbers [VI Congr. Int. Ent. Madrid] 1: 181-186, ill. **Berland, L.**—Exploration entomologique de l'atmosphère en avion. [VI Congr. Int. Ent. Madrid] 1: 29-31. **Bryson, H. R.**—The identification of soil insects by their burrow characteristics. [Trans, Kansas Acad. Sci.] 42: 245-253, ill. **Cousin, G.**—Sur une formule permettant l'estimation exacte et la comparaison des indices biométriques, chez des hybrides interspécifiques de Gryllides et chez des criquets de phases différentes. [Comp. Rend. Sea. Acad. Sci.] 210: 583-586. **Garcia del Cid, F.**—Insectos bibliófagos y sus enemigos en las bibliotecas de Cataluña. [VI Congr. Int. Ent. Madrid] 1: 399-404, ill. **Goodrich, A. L.**—Starling attacks upon warble infested cattle in the Great Plains area. [103] 13: 33-40. **Gregson, J. D.**—The importance of phenological notations during insect ecological studies. [Pro. Ent. Soc. Brit. Col.] No. 34: 46-47. **Hoffmann, C. H.**—Additions to annotated list of insects reared from elm bark and wood. [19] 35: 54-63. **Horn, W.**—Obituary by K. B. Lal. [Current Sci.] 8: 384-385. **Imhof, O. E.**—Pteronologica. [VI Congr. Int. Ent. Madrid] 1: 393-397, ill. **Jordan, H. E. K.**—Where subspecies meet. [VI Congr Int. Ent. Madrid] 1: 145-151.

Kennedy, C. H.—Definitions of the animal family and the animal society. [VI Congr. Int. Ent. Madrid] 1: 33-44. **Mello-Leitão, C.**—Notes sur la systématique des Palpigrades. [VI. Congr. Int. Ent. Madrid] 1: 143-144. **Nuttall, G. H. F.**—Notes on the preparation of papers for publication on the Journal of Hygiene and in Parasitology. [116] 32: 1-62. **Park, Barden & Williams.**—Studies in Nocturnal Ecology, IX. Further analysis of activity of Panama rain forest animals. [84] 21: 122-134, ill. **Richmond, H. A.**—Some notes on the periodicities of certain insects in relation to the sun spot cycle. [Pro. Ent. Soc. Brit. Col.] No. 34: 49-52, ill. **Simpson, G. G.**—Types in modern taxonomy. [Amer. Jour. Sci.] 238: 413-431. **Spencer, G. J.**—Ectoparasites of birds and mammals of British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 36: 16-23. **Spencer, W. P.**—See under Diptera. **Valentine, J. M.**—A major cycle in insect flights. [68] 91: 544. **Wishart, G.**—An adaptation of a standard bi-metallic thermo-regulator to control variable temperatures. [4] 72: 78-81, ill. **Zimmerman & Read.**—List of available publications of the United States Department of Agriculture, January 2, 1940. [U. S. Dept. Agric.] Misc. Publ. No. 60: 212 pp.

ANATOMY, PHYSIOLOGY, ETC.—**Britton, E. B.**—A note on the structure of the eye in Aepus (Coleo.: Carabid.). [8] 76: 73. **Carothers, E. E.**—A cytological study of X-rayed grasshopper embryos. [Journ. Morph.] 66: 529-559, ill. **Cerruti, M.**—See under Coleoptera. **Chopard, L.**—La nervation de l'elytre chez les Gryllides males et la formation du miroir. [VI Congr. Int. Ent. Madrid] 1: 81-85, ill. **Clare & Tauber.**—Circulation of hemolymph in the wings of the cockroach Blattella germanica in normal wings. [Iowa State Coll. Jour. Sci.] 14: 107-127, ill. **Dallas, E. D.**—(see under Coleoptera). **Eberle, G.**—Litomastix truncatellus (Encyrtid.) ein polyembryonaler Schmarotzer von Goldeulen (Plusia)—Raupen. [18] 53: 362-371, ill. **Ebner, R.**—(see under Orthoptera). **Ferris, G. F.**—The morphology of Plega signata (Mantispid.). [Microent.] 5: 33-56, ill. **Gohrbandt, I.**—Phyletische korrelationen bei flügelreduzierten und rüsselreduzierten Syntomiden. [89] 73: 313-338, ill. **Guibe, J.**—Contribution a l'etude d'une espece Apterina pedestris. [Bull. Biol. France Suppl.] 26: 112 pp., ill. **Haydak & Palmer.**—Vitamin content of bee foods. [12] 33: 396-397. **Hayrak, M. H.**—The length of

development of the greater wax moth. [68] 91: 525. **Henson, H.**—The structure and postembryonic development of Vanessa urticae (Lep.).—The malphigian tubules of the pupa and imago. [93] B, 109: 357-372, ill. [**Hilton, W. A.**—Nervous System and Sense Organs] LXXXII: Lepidoptera. [13] 32: 23-29, ill. **Hodge, C.**—The anatomy and histology of the alimentary tract of Radenotatum carinatum var. peninsulare (Orth.: Acridid.). [Journ. Morph.] 66: 581-603, ill. **Hoffmann, C. E.**—The relation of Donacia larvae (Coleo.: Chrysomel.) to dissolved oxygen. [84] 21: 176-183. **James, M. T.**—Duplication of antennae in Diptera. [19] 35: 50. **Kemner, N. A.**—(see under Diptera). **Kozhantschikov, I. W.**—Die physiologische charakteristik des temperatur-optimums der insekten-entwicklung. [VI. Congr. Int. Ent. Madrid] 1: 59-72. **Mellanby, K.**—Low temperature and insect activity. [Pro. Ry. Soc. London] 127, (B): 473-487. **Ochmann, A.**—Die Eientwicklung der Palpenmotte Semioscopis avellanella. [18] 53: 349-352, ill. **Pospelov, W.**—Fertility of certain obnoxious Lepidoptera in connection with meteorological conditions. [VI Congr. Int. Ent. Madrid] 1: 195-202, ill. **Pryor, M. G. M.**—On the hardening of the ootheca of Blatta orientalis. [Pro. Ry. Soc. London] 128, (B): 378-393. On the hardening of the cuticle of insects. [Pro. Ry. Soc. London] 128, (B): 393-407, ill. **Rawlinson, R.**—Studies on the life history and breeding of Ecdyonurus venosus (Ephemerida). [93] B, 109: 377-450, ill. **Sick, H.**—Beitrag zur Kenntnis der Dioptidae, Notodontidae und Thaumetopoeidae und deren Verwandtschaftsbeziehungen zueinander. [89] Abt. Anat., 66: 263-290, ill. **Spencer, C. J.**—Upon the function of the pseudosternite in the Acridiidae. [Pro. Ent. Soc. Brit. Col.] No. 35: 3-5. **Storey, H. H.**—Investigations of the mechanism of the transmission of plant viruses by insect vectors. [Pro. Ry. Soc. London] 127, (B): 526-542, ill. **Sundermeier, W.**—Der Hautpanzer des Kopfes und des Thorax von Myrmeleon europaeus und seine Metamorphose. [89] Abt. Anat., 66: 291-348, ill. **Tiegs, O. W.**—The embryology and affinities of the Symphyla, based on a study of Hanseniella agilis. [53] 82: 225 pp., ill. **Tonnoir, A. L.**—(see under Diptera). **Zernoff, V.**—L'immunité et la sérothérapie chez les insectes. [VI Congr. Int. Ent. Madrid]. 1: 153-161.

ARACHNIDA AND MYRIOPODA.—Grandjean, F.—L'evolution des Ongles chez les Oribates. [Bull. Mus. Nat.

Hist. Nat.] 11: 539-546. **Gregson, J. D.**—Notes on some phenomenal feeding of ticks. [Pro. Ent. Soc. Brit. Col.] No. 34: 8-12, ill. (1938). **Holland, G. P.**—Notes on the ecology of Dermacentor andersoni in southern Alberta. [Pro. Ent. Soc. Brit. Col.] No. 36: 8-11. **Hubbard, W. E.**—Observations on Entonyssus ewingi. [Trans. Amer. Micro. Soc.] 59: 243-247, ill. **Keifer, H. H.**—Eriophyid Studies VIII. [Bull. Dept. Agr. Calif.] 29: 21-46, ill. (k*). **de Mello-Leitao, C.**—Aranas de la Provincia de Buenos Aires y de las gobernaciones de la Pampa, Neuquén Rio Negro y Chubut. [Rev. Mus. de la Plata] 2: 62 pp., ill. (*s). Notes sur la famille Ctenidae et sa distribution géographique. [VI Congr. Int. Ent. Madrid] 1: 103-109. (sk*). **Tiegs, O. W.**—(see under Anatomy).

THE SMALLER ORDERS OF INSECTS.—Andre, F.—The Nearctic spp. of Elaphrothrips (Thysanoptera.) [10] 42: 75-90, ill. (K). **Buckell, E. R.**—Some locality records of British Columbia dragonflies. [Pro. Ent. Soc. Brit. Col.] No. 34: 55-62. **Crawford, J. C.**—The male of Heliothrips haemorrhoidalis (Thysanoptera). [10] 42: 90-91, ill. **Ferris, G. F.**—(see under Anatomy). **Holland, G. P.**—New records of Siphonaptera for British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 36: 11-12. Phenomenal infestation of ectoparasites on marmot, weasel & packrat. [Pro. Ent. Soc. Brit. Col.] No. 35: 27-28. ill. **Hubbard, C. A.**—American mole and shrew fleas [Pacific Univ. Bull.] 37: 12 pp., ill. (*). West Coast Catallagias. [Pacific Univ. Bull.] 37: 4 pp., ill. (*). **Jacob, J. K.**—Mass collecting of Labia minor, the small earwig. [Pro. Ent. Soc. Brit. Col.] No. 34: 18-19. (1938). **Quadri, M. A. H.**—A suggested modification of the mallophagous genus Colpocephalum. [Ind. Jour. Ent.] 1: 65-67, ill. (*). **Ricker, W. E.**—A preliminary list of stoneflies from the vicinity of Cultus Lake, British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 35: 19-23. **Rohdendorf, B. B.**—Body structure of Archodonata and position of this order in the system of Palaeoptera. [Comptes Rendus Acad. Sci. U. S. S. R.] 26: 108-110, ill. **Scourfield, D. J.**—The oldest known fossil insect (Rhyniella praecursor)—further details from additional specimens. [Proc. Linn. Soc. London] 1940: 113-131, ill. **Spencer, G. J.**—Further notes on the fleas of British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 34: 36-38. (1938). (see under Diptera).

ORTHOPTERA.—Chopard, L.—(see under Anatomy). **Ebner, R.**—Veränderungen an Orthopteren durch parasitische Würmer. [VI Congr. Int. Ent. Madrid] 1: 341-347, ill. **Fox-Wilson, G.**—The sexual ratio of the common earwig, Forficula auricularia (Dermaptera), as observed in trap bands. [107] A, 15: 17-20, ill. **Gregson, J. D.**—Notes on the occurrence of Grylloblatta campodeiformis in the Kalmoops District. [Pro. Ent. Soc. Brit. Col.] No. 35: 29-30. **La Greca, M.**—Su alcuni Mantidi dell'America Centrale e Meridionale. [Ann. Mus. Zool. R. Univ. Napoli] 7: 1-4. **Spencer, C. J.**—See under Anatomy. **Thorne, G.**—The hairworm, Gordius robustus, as a parasite of the mormon cricket, Anabrus simplex. [91] 30: 219-231, ill.

HEMIPTERA.—Beamer, R. H.—The gen. Cochlorhinus and some related genera of leafhoppers (Cicadell.). [103] 13: 51-57, ill., (K*). **Brittin, G.**—The validity of the coccid genus Eulecanium. [Trans. & Proc. Ry. Soc. New Zealand] 69: 410-412. **Bueno, J. R. de la Torre.**—Additions and corrections to a "synopsis of the Hemiptera-Heteroptera of America north of Mexico", Pt. I. [19] 35: 51-53, (k). A new record from New Mexico (Pentatomid.: Brochymena dilata). [19] 35: 63. Food plant of a Coreid bug [Thasus acutangulus]. [19] 35: 45. **Heriot, A. D.**—Biological and morphological differences between Eriosoma crataegi and Eriosoma lanigera. [Pro. Ent. Soc. Brit. Col.] 34: 22-32, ill. (1938). **Jordan, K. H. C.**—Einige Bemerkungen uber Cryptostemmatidae. [18] 53: 341-344, ill. **Knowlton & Bischoff.**—Studies of Western Aphid [Contr. Dept. Ent., Utah Agric. Exp. Sta.] p. 69. **Lameere, A.**—Évolution des Hémiptères. [VI Congr. Int. Ent. Madrid] 1: 17-22. **Sailer, R. I.**—A n. sp. of Thyreocorinae. [103] 13: 62-63, ill. **Strickland, E. H.**—Additional Fulgoridae taken in Alberta. [4] 72: 87-88. **Venables, E. P.**—The scale insects of British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 35: 23-24.

LEPIDOPTERA.—Berio, E.—Nuonyo genere e specie di Erastriinae dell 'Argentina (Noctuid.). [27] 71: 186-187, ill. **Chermock & Chermock.**—Some new diurnal Lepidoptera from the Riding Mts., and the Sand Ridge, Manitoba. [4] 72: 81-83. **Clark, A. H.**—Butterflies of Virginia. [Smiths Inst.] Publ. 3586: 63-66, ill. **Field, W. D.**—Distributional notes on Copaeodes aurantiaca (Hesperiid.). [103] 13: 50. A distribution note on Grais stigmaticus (Hesperiid.). [103] 13: 57. A new skipper record for the

United States. [103] 13: 57. **Fletcher, T. B.**—New generic names for Microlepidoptera. [21] 52: 17-19. **Gohrbrandt, I.**—(see under Anatomy). **Johnson, J. W.**—The allotype of Calosaturnia albofasciata (Saturniid.). [19] 35: 46-50, ill. **Lange, W. H.**—An apparently new Alaskan Platyptilia (Pterophor.). [4] 72: 84-85, ill. **Llewellyn-Jones, J. R. J.**—A brief note on an attempt to hybridize Notolophus antiqua badia and Hemerocampa pseudotsugata. [Pro. Ent. Soc. Brit. Col.] No. 36: 14-15. Some food plants of lepidopterous larvae. [Pro. Ent. Soc. Brit. Col.] No. 34: 20-21: No. 35: 24-27; No. 36: 13-14. **Maheux, G.**—Le liparis du saule (Stilpnotia salicis) in Quebec. [98] 67: 73-77. **Schwanwitsch, B. N.**—On some general principles observed in the evolution of the wing-pattern of palaearctic Satyridae. [VI Congr. Int. Ent. Madrid] 1: 1-8, ill. **Sick, H.**—See under Anatomy.

DIPTERA.—Alexander, C. P.—New or little known Tipulidae, LVII: Neotropical species. [75] 5: 275-297. **Eddy & Emerson.**—Notes on Oklahoma bot flies. [103] 13: 44-45. **Edwards & Box.**—Notes on mosquitoes. [75] 5: 314-322, (S). **Harmston & Knowlton.**—New mid-western Dolichopodidae. [103] 13: 58-61, ill. **Hill, N. D.**—Biological and taxonomic observations on the mosquitoes of Kansas. [Trans. Kansas Acad. Sci.] 42: 255-265. **Jacob, J. K.**—A preliminary list of the Bibionidae of British Columbia and some locality records. [Pro. Ent. Soc. Brit. Col.] No. 35: 13-15, **Kemner, N. A.**—Die flügel der Termitoxenien. [VI Congr. Int. Ent. Madrid] 1: 275-294, ill. **Komp, W. H. W.**—The occurrence of Anopheles darlingi root in British Honduras and Guatemala. [68] 91: 522-523. **Painter, R. H.**—Notes on type specimens and descriptions of new North American Bombyliidae [Trans. Kansas Acad. Sci.] 42: 267-301, ill. (*k). **Parker & Wenger.**—The Juniper Midge, Contarinia juniperina (Cecidomyiid.), a pest of red cedars. [103] 13: 46-50, ill. **Schmitz, H.**—Zum ausbau der systematik der Termitoxeniidae. [VI Congr. Int. Ent. Madrid] 1: 9-15. **Shewell, G. E.**—Preoccupied names in the gen. Homoneura (Lauxaniid.). [4] 72: 86, (*). **Spencer, G. J.**—Ectoparasites of deer in British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 35: 15-19. A triple stratiomyid wing. [Pro. Ent. Soc. Brit. Col.] No. 35: 10-11, ill. Ectoparasites of birds and mammals of British Columbia. [Pro. Ent. Soc. Brit. Col.] No. 34: 39-45. (1938). **Spencer, W. P.**—Subspecies,

hybrids and speciation in Drosophila hydei and D. viridis. [90] 74: 157-179, (*). **Stains & Knowlton.**—A new Myopa from Utah. [Contr. Dept. Ent. Utah Agric. Exp. Sta.] p. 51. (*). **Tonnoir, A. L.**—Sur un remarquable organe sexuel secondaire chez certains mâles du genre Nemopalpus avec description d'une espèce nouvelle et d'une autre peu connue. [VI Congr. Int. Ent. Madrid] 1: 203-213, ill. (*).

COLEOPTERA.—Arrow, G. J.—A nomenclatural note (Scarab.). [107] B, 9: 16, (S*). **Balfour-Browne, W. A.**—The generic names of the British Hydradephaga. [R. Ent. Soc. Lond., Gen. Names Brit. Ins.] Pt. 7: 196-209, **Beaulne, J. I.**—Contribution a l'etude des Cicindelides du Canada. [98] 67: 79-83, (k). Contribution a l'etude des Coleopteres du Canada: Fam. Mordellidae. [98] 67: 84-86, (k). **Brown, W. J.**—Notes on the American distribution of some spp. of Coleoptera common to the European and North American continent. [4] 72: 65-78, (K). **Bryant, G. E.**—A n. sp. of injurious Phytophaga (Halticinae) from the Argentine Republic. [107] B, 9: 54. **Cerruti, M.**—Larve di Paederus (Staphylinid.). [27] 72: 27-32, ill. (k). **Dallas, E. D.**—Monstruosidad doble, bilateral y simétrica en un carábido y consideraciones etiológicas. [VI Congr. Int. Ent. Madrid] 1: 129-136, ill. **Dibb, J. R.**—Further notes on the genus Popilius (Passalid.). [8] 76: 76-77, (SK*). **Fleutiaux, E.**—Elaterides nouveaux. [33] 80: 89-104, (S*). **Guignot, F.**—Quinzième note sur les Hydrocanthares. [25] 45: 9-12. (*s). **Hoffman, C. E.**—Morphology of the immature stages of some northern Michigan Donaciini (Chrysom.). [Pap. Michigan Acad. Sci. A & L] 25: 243-290, ill. **Nunberg, M.**—Nuevas especies de Coleópteros del género Platypus del Perú. [Bol. Mus. Hist. Nat. "Javier Prado"] 4: 63-69, ill. (*). **Pic, M.**—Addenda et corrigenda au Coleopterorum Catalogus Junk et Schenkling, pars 135, par Klima. [Curc.: Gynm., Nanoph.]. [VI Congr. Int. Ent. Madrid] 1: 349-352. **Saylor, L. W.**—Note on Serica pruinipennis Saylor (Scarab.). [13] 32: 30. **Tottenham, C. E.**—Some notes on the nomenclature of the Staphylinidae. [107] B, 9: 49-53.

HYMENOPTERA.—Bequaert, J.—Notes on the distribution of Pseudomasaris and the foodplants of the Masaridinae and Gayellinae (Vespid). [19] 35: 37-45. **Cockerell, T. D. A.**—Note on a fossil sawfly from Creede, Colorado. [19] 35: 72. **Cushman, R. A.**—The Ichneumon-flies of the

subfam. Neorhacodinae, with descriptions of a n. gen. and three n. spp. [50] 88: 523-527, ill. (K). **Eberle, G.**—See under Anatomy. **Gahan, A. B.**—A contribution to the knowledge of the Eucharidae (Chalcid.). [50] 88: 425-458, (k*). **Jenks, C. E.**—An insect Jekyll and Hyde [Pedinaspis planatus; Psammocharidae]. [Nat. Hist., N. Y.] 45: 297-302, ill. **Knowlton & Harmston.**—Some entomophagous Utah Hymenoptera. [Utah Acad. Sci. Arts & Let.] 16: 59-63. **Muesebeck, C. F. W.**—Two new reared spp. of Bassus (Braconid.). [10] 42: 91-93. **Schwarz, H. F.**—A key to the known Anthidiine bees of Oregon, with description of some new forms. [40] no. 1058; 8 pp., ill. **Walley, G. S.**—A n. sp. of Brachycyrtus from British Columbia (Ichneumon.). [4] 72: 85-86.

SPECIAL NOTICES.—British Water Beetles. Volume 1. By F. Balfour-Browne. London. 375 pp., ill. **Diptères Nématocères.** By E. Seguy. Faune de France. Volume 36. 1940. 368 pp., ill. **Fauna of British India,** including the remainder of the Oriental Region. Diptera. Vol. VI. Family Calliphoridae. By White, Aubertin & Smart. 288 pp., ill.

LIVING LIGHT. By E. NEWTON HARVEY. Princeton University Press 1940. Pp. xv, 328, frontispiece in colors (Dragonfish pursuing luminescent squid), 88 figures, $4.00. The Introduction to this very attractive volume opens with this paragraph: "Twenty-five years have passed since the author first started investigation of living light and twenty years since the publication of *The Nature of Animal Light*. From 1920, much progress has been made in our knowledge of light emission by living things—bioluminescence. "Living Light" includes this new work but is much more than a second edition of the older book. New chapters dealing with the morphology and physiology of light production in various groups of luminous animals have been introduced and other aspects completely rewritten to include the recent experiments. Special attention is devoted to various types of non-living luminescence. The historical approach has been adopted and each chapter will be found complete in itself, presenting the subject matter of interest to biologist, chemist or physicist." The titles of the chapters are: I. Cold Light (pp.3-22), II. Light-producing Organisms (23-87), III. Types of Luminescence (88-121), IV. Chemistry of Light Production (122-159), V. Physiology of Light Production (160-193), VI. Physical Nature of Animal Light (194-226). A classified,

selected bibliography occupies pp. 227-256, an author index 311-318, a subject index 319-328. The great majority of the often wonderful illustrations, mostly half-tones from many sources and many now published for the first time, are massed on pp. 257-307. The light-producing organisms are found in two groups of plants, bacteria and fungi, and in 11 of 17 phyla of the animal kingdom. This review is concerned chiefly with the luminous terrestrial arthropods— there are light-producing spiders (reported but not caught or identified), myriopods, spring-tails, flies, moths and beetles. Luminous bacterial maladies of living mayflies, midges, mole-crickets and caterpillars have been described. Some investigators have supposed that the light of practically all luminous animals, even the fire-flies, is of symbiotic bacterial origin, but Prof. Harvey thinks it would be "an exaggeration to consider that *all* bioluminescence is bacterial in origin." He tells us in two different places (pp. 33, 160) that steady luminescence in an animal can be attributed *a priori* to the presence of symbiotic bacteria; "the only possible exception is the beetle *Phengodes* whose light is continuous, although it has not been studied sufficiently to state that is contains luminous bacteria." Luminescence, or "cold light," is distinguished from incandescence, or "hot light," in that the former is not due to temperature radiation while the latter is so caused (pp. 3, 93). In some cases the luminescence is produced by the oxidation of a substance, luciferine, in the presence of an enzyme, luciferase. These two have been found only in beetles (both elaterids and lampyrids), molluscs, ostracods, certain worms and decapods, but not in the other numerous groups of luminescent organisms, (pp. 133-134). Luminescence may be under nerve or hormone control in fireflies, the elaterid beetle *Pyrophorus* and the fly larva *Boletophila* (p. 161). Theories of the flashing of fireflies are discussed (pp. 165-171), but "the physiology of flashing is in a very unsatisfactory state;" "flashing itself is always induced by a definite light intensity" (p. 179). In chapter VI there are various physical measurements of firefly light. It is pointed out that "generally, luminescence has appeared sporadically in the living world, with a few luminous species scattered here and there among structurally very close non-luminous relatives. This again means that luminescence can be readily developed in the course of evolution by some slight change in mechanism *already existing* within all cells, I believe this mechanism is the respiratory one" (p. 159). Two slight entomological slips have been noticed: *Fulgora,* the lantern-fly, whose luminous claims are rejected, is referred to as a beetle (p. 13), and

the name of the elaterid mentioned in the footnote on page 70, should be *Melanactes*. It is a pleasure to recommend this book to all interested in a subject which its author has found and has made so fascinating.—P. P. CALVERT.

OBITUARY

Science for June 7, 1940, announces the deaths of Dr. WILLIS STANLEY BLATCHLEY, on May 28, and of Dr. RALPH VORIS on May 9.

Dr. Blatchley, who was State Geologist of Indiana 1894-1911, has done more for the interests of taxonomic entomologists of eastern North America, especially of those beginning serious study, than any other single individual, by his composition and publication of the four manuals: *Coleoptera of Indiana* (1910), *Rhynchophora of North Eastern America* (with C. W. Leng, 1916), *Orthoptera of Northeastern America* (1920) and *Heteroptera of Eastern North America* (1926). They testify to his tremendous mental and physical energy. He was author also of books on general natural history. He was born at North Madison, Connecticut, October 6, 1859. He published two collections of autobiographical and bibliographical data: *Blatchleyana I* (1930) and *II* (1939—Indianapolis, The Nature Publishing Co.) which record the salient events of his career. No. II states that his entire collection of mounted insects, including holotypes of 470 new species which he described, was disposed of to the Dept. of Entomology, Purdue University, Lafayette, Indiana, in June, 1935, and that his unmounted duplicates had previously been sent to the British Museum, London. Dr. Blatchley, at the time of his death, was one of ten honorary fellows of the Entomological Society of America, an honorary fellow of the Indiana Academy of Science, a Correspondent of the Academy of Natural Sciences of Philadelphia and a Corresponding Member of the American Entomological Society.

Dr. Voris was born at Newkirk, Oklahoma, June 23, 1902, received a Ph.D. from the University of Indiana in 1928, and in the same year became professor of biology in Southwest Missouri State Teachers College at Springfield, a position held to the time of his death. He studied the immature stages of the Staphylinid beetles, on which he published in the *Transactions of the Academy of Sciences of St. Louis* (1934), *Annals of the Entomological Society of America* (June, 1939) and ENTOMOLOGICAL NEWS (June, July, 1939).

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